REMARKS

Claims 1,2,4,5,9,10 and 15-21, all the claims pending in the application, stand rejected. Claims 1, 2, 4, 19 and 20 are amended. The amendment is clearly supported by the teachings at page 11, lines 7-12 of the original application.

Claim Rejections - 35 USC § 103

Claims 1-2, 9-10/(1-2), and 17/(1-2) are rejected under 35 U.S.C. 103(a) as being unpatentable over Berkey et al. (US Patent 6,265,115) in view of either Okamoto et al. (US 6,020,109) or Shoki et al. (US 2002/0110743), further in view of Jacquinot et al. (US 6,126,518) and Miura et al. (US 6,027,669) as evidenced by Grant et al. (Grant & Hackh's Chemical Dictionary, Fifth Edition, 1987), and further in view of either Nakamura et al. (US 5,429,730) or Hayden et al. (US 6,346,352). This rejection is traversed for at least the following reasons.

Berkey

Berkey is the basic reference relied upon by the Examiner. The Examiner admits that Berkey does not teach the following five features of the claimed invention and looks to other references for relevant teachings.

(1) The colloidal silica has a pH between 7.0 and 7.6.

(2) The colloidal silica is produced by produced by hydrolysis of an organosilicon compound.

(3) The colloidal silica has an alkali metal content of 0.1 ppm or less.

(4) The glass substrate is either (a) for a phase shift mask (PSM) blank or (b) for a EUV reflective mask blank.

(5) The glass substrate has suppressed occurrence of a phase defect caused by a protrusion.

Jacquinot

The Examiner looks to Jacquinot for supplemental teachings with regard to certain of these deficiencies. Regarding limitation(1), "the colloidal silica has a pH between 7.0 and 7.6". Jacquinot discloses that the colloidal silica has a pH between 6.5 and 7.5.

However, Jacquinot teaches that the application for the silica is a semiconductor substrate. By contrast, Berkey teaches the glass substrate as application.
Thus, the application is different as between Berkey and Jacquinot. One skilled in the art would not look to the process of a semiconductor substrate for the production process for a glass substrate. In other words, there is no basis for combining the teachings of Berkey with Jacquinot.

Miura

The Examiner looks to Miura for a teaching regarding limitation (3) "the colloidal silica has an alkali metal content of 0.1 ppm or less". Miura discloses that it is preferred that the colloidal silica polishing composition contains as little metal as possible. However, Miura fails to disclose the specific value of 0.1 ppm or less.

As to limitation (5), "the glass substrate has suppressed occurrence of a phase defect caused by a protrusion," none of the references teach this limitation.

Claimed Features

As recited in the amended claims, the surface of the glass substrate is polished so as to have a surface roughness required in an exposure wavelength to be used so that a height of a protrusion on the surface of the glass substrate falls within a phase defect range that is allowable

for the exposure wavelength, the protrusion being generated by an aggregate of the colloidal silica abrasive grains adhered to the surface of the glass substrate. The cited references fail to teach this feature.

Nakamura

Applicants respectfully submit that Nakamura discloses removing the protrusion **after** a polishing process. By contrast, according to the present invention, the protrusion is removed **during** the polishing process.

Hayden

Similarly, Applicants respectfully submit that Hayden discloses removing the protrusion **after** a polishing process, while in the present invention, the protrusion is removed **during** the polishing process.

Okamoto

As expressly stated by the Examiner, Okamoto is cited merely as general background art. The reference does not remedy the deficiencies of the main references

Shoki et al

As expressly stated by the Examiner, Shoki et al is cited merely as general background art. The reference does not remedy the deficiencies of the main references

Grant

Grant does not remedy the deficiencies of the main references.

Conclusion

As discussed above, the present invention is different from the combination of the cited references and thus is clearly patentable over the combination. The examiner asserts that the applicable test is what the combined teachings of the references would have suggested to those

of ordinary skill in the art. However, first, there must be a reason to combine the five items of prior art. The Examiner has not identified a reason for picking bits and pieces of different references with conflicting or incompatible purposes and combining them together. The Examiner clearly must use the Applicant's invention as a blueprint to take the selected features and meld them together to form a process that only applicants have first demonstrated can arrive at significant improvements in mask blank quality.

Claims 4-5, 9-10/(4), 15-16, 17/(4), and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshikawa et al. (US 2003/0228461) in view of Watanabe et al. (US 6,277,465) and Maekawa et al. (US 5,868,953), further in view of Berkey et al. (US Patent 6,265,115) and either Okamoto et al. (US 6,020,109) or Shoki et al. (US 2002/0110743), and further in view of either Nakamura et al. (US 5,429,730) or Hayden et al. (US 6,346,352). This rejection is traversed for at least the following reasons.

As with Berkey, the Examiner admits that Yoshikawa et al. do not specifically teach:

(4) that the glass substrate is [a] for a PSM blank to be exposed by either an ArF or an F2 excimer laser or [b] for an EUV reflective mask blank;

(5) that the glass substrate has suppressed occurrence of a phase defect caused by a protrusion or a bump on the surface of the glass substrate;

(6) that a thin film for causing an optical change in exposure light is formed on the glass substrate (instant claim 9/(4));

(7) that the thin film is patterned to produce a mask (instant claim 10/(4)); or

(8) plural polishing steps using colloidal silica at successively lower pressures to suppress the occurrence of a fine convex protrusion at the end of the polishing process (instant claims 4-5).

The Examiner then supplements these deficiencies by picking parts of the diverse teachings of several references to meet the claimed invention, which as to claim 4 and its dependent claims now further recites that the height of the protrusion on the surface of the glass substrate falls within a phase defect range that is allowable for the exposure wavelength, the protrusion being generated by an aggregate of the colloidal silica abrasive grains adhered to the surface of the glass substrate. This allows achievement of the desired phase performance.

Yoshikawa, Maekawa and Watanabe were all distinguished in the previous amendment based upon their diverse applications, while the present invention is applied to the production of a glass substrate for a phase shift mask blank to be exposed by the ArF excimer laser, a glass substrate for the phase shift mask blank to be exposed by the F_2 excimer laser, and a glass substrate for the EUV reflective mask blank. Maekawa and Watanabe were shown to fail a disclosure of the specific application used in the specific wavelength according to the present invention. Also, Maekawa and Watanabe fail to the claimed surface roughness control step using the polishing liquid comprising colloidal silica abrasive grains in the polishing process and the protrusion suppressing step of changing the pressure.

Berkey et al, Okamoto et al and Shoki et al already have been distinguished. Thus, these claims are patentable for the reasons given above and for reasons given with respect to claim 1.

The newly cited references to **Nakamura and Hayden** are distinguishable because they both discloses removing the protrusion **after** a polishing process. By contrast, according to the present invention, the protrusion is removed **during** the polishing process.

Claims 18/(1-2) and 19-20 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Berkey et al. (U.S. Patent No. 6,265,115) in view of either Okamoto et al. (U.S. Patent No. 6,020,109) or Shoki et al. (U.S. Pub. No. 2002/0110743), and further in

view of Jacquinot et al (U.S. Patent No. 6,126,518) and Miura (U.S. Patent No. 6,027,669) as evidenced by Grant et al (Grant & Hackh's Chemical Dictionary, Fifth Ed., 1987), and further in view of Oki (U.S. Patent No. 5,581,345) and further in view of either Nakamura et al. (US 5,429,730) or Hayden et al. (US 6,346,352). This rejection is traversed for at least the following reasons.

The Claimed Invention

Claim 18 depends from claim 4 and recites the use of defect inspection using laser interference confocal optics.

Claims 19 and 20 are independent and are directed to the production of a glass substrate for a glass blank, which necessarily focuses the invention on specific quality requirements, as already discussed. As with claim 4, these claims have been amended to specify the presence of protrusions that cause phase defects and the use of an alkali metal content in colloidal silica abrasive grains at a level of 0.1 ppm or less. This permits the suppression of protrusions and the achievement of the desired phase performance.

The Prior Art

Oki et al is merely cited for its teachings of the use of confocal laser scanning mode interference contrast microscope apparatus of system for a method of measuring minute step height. This appears to be relevant only to claim 18, and not claims 19 or 20. Nonetheless, Oki et al does not remedy the deficiencies of the other cited art, as already discussed.

The newly cited references to **Nakamura and Hayden** are distinguishable because they both discloses removing the protrusion **after** a polishing process. By contrast, according to the present invention, the protrusion is removed **during** the polishing process.

Claim 18(4) is rejected under 35 U.S.C. § 103(a) as being unpatentable over Yoshikawa et al. (U.S. Pub. No. 2003/0228461) in view of Watanabe et al. (U.S. Patent No. 6,277,465), and Maekawa et al. (U.S. Patent No. 5,868,953), and further in view of Berkey et al. (U.S. Patent No. 6,265,115) and either Okamoto et al. (U.S. Patent No. 6,020,109) or Shoki et al. (U.S. Pub. No. 2002/0110743), in view of Oki (U.S. Patent No. 5,581,345) and further in view of either Nakamura et al. (US 5,429,730) or Hayden et al. (US 6,346,352).. This rejection is traversed for at least the following reasons.

The Claimed Invention

Claim 18 depends from claim 4 and recites the use of defect inspection using laser interference confocal optics.

The Prior Art

Oki et al is merely cited for its teachings of the use of confocal laser scanning mode interference contrast microscope apparatus of system for a method of measuring minute step height. As already noted, Oki et al does not remedy the deficiencies of the other cited art, as already discussed.

The newly cited references to **Nakamura and Hayden** are distinguishable because they both discloses removing the protrusion **after** a polishing process. By contrast, according to the present invention, the protrusion is removed **during** the polishing process.

Summary

In conclusion, the Examiner has added the new references to Nakamura and Hayden to the previous rejections. Applicants have distinguished these two references because of a significant distinction that would make them unsuitable for the disclosed and claimed application, namely removing the protrusions **during** the polishing process. The Examiner has taken pieces from more than a half dozen diverse references and has combined them together, again using Applicants own invention as a roadmap. This is the clearest form of impermissible hindsight, even under the KSR Guidelines. Applicants submit that the invention as now claimed, with its several limitations, is not obvious from the prior art cited by the Examiner.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

/Alan J. Kasper/

Alan J. Kasper
Registration No. 25,426

SUGHRUE MION, PLLC
Telephone: (202) 293-7060
Facsimile: (202) 293-7860
WASHINGTON OFFICE
23373
CUSTOMER NUMBER

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